Industry Foundation Classes - *Release 2.0*

An Introduction to the

International Alliance for Interoperability

and the

Industry Foundation Classes

Beta - January 10, 1999

International Alliance for Interoperability

Enabling Interoperability in the AEC/FM Industry

Industry Foundation Classes - Release 2.0

An Introduction to the International Alliance for Interoperability and the Industry Foundation Classes

Enabling Interoperability in the AEC/FM Industry

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The Fractured Information System

The building construction industry is composed of many disciplines. Each of these has evolved independently, with its own unique terminology, technology, and way of expressing and communicating information. This has caused many problems in sharing information among the disciplines. Even within a discipline, there are losses of project information and difficulties in communication. This fractured method of working together adds significantly to the cost of a project.

Currently, CAD applications in the building construction industry have little ability to share building information. As an example, the recently completed Denver International Airport received significant press coverage due to problems in completing the project. When designers began their work, the more than twenty different disciplines were using a variety of CAD platforms and third-party applications. Because most of the differing platforms could not communicate with one another, there were only two choices available:

1. Standardize on a specific platform and set of applications.

   This would require several design companies to purchase new software and possibly hardware at great expense.

   Furthermore, their staffs would need to be trained to proficiency with these new tools.

2. Find the lowest common denominator between the platforms and the applications and then communicate at that level.

   This would allow companies to work in the manner they were most accustomed, but sharing information electronically would often be sacrificed.

The latter solution was chosen, because it was the only economically viable possibility.

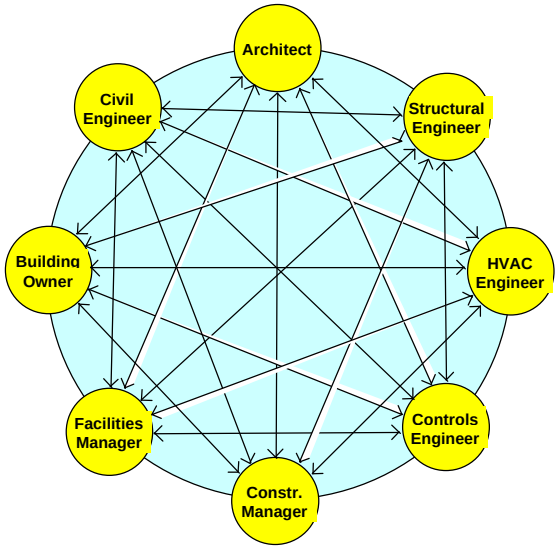

Figure 1: The Fract Information System

The Denver Airport project is typical of conditions and choices across the industry today. The lack of interoperable software solutions limits the ability to improve productivity. The life cycle of a building—including design, construction, and facility management —encompasses intensive and cumbersome processes. There are numerous players involved at various intervals throughout the life cycle, all adding and retrieving information. Much of this work is still done manually. The information that is transferred can be lost, misinterpreted, or recorded with errors.

The work being done by the International Alliance for Interoperability (IAI) is an effort to raise the common denominator. To be able to generate data that can be read by another software application utilizing the same standards, reading from the same dictionary, and speaking the same language can have an enormous impact on the whole building process.

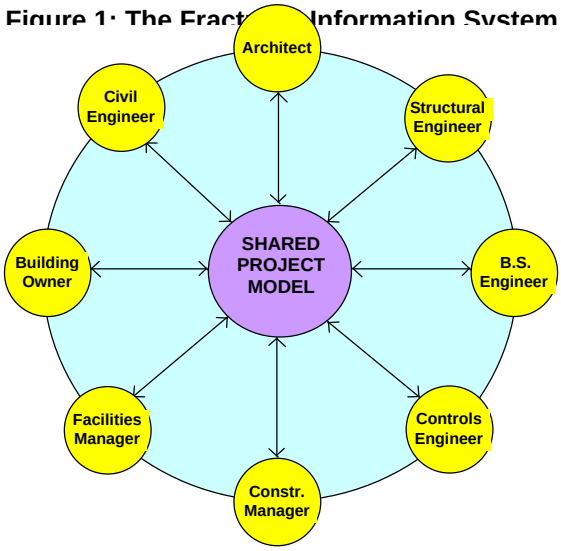

Figure 2: The Vision of Interoperability

Comparison with Other Industries

There is always much to be learned from other industries., particularly those that have similarities to building construction such as process engineering and shipbuilding. In technology development, there is often a view that other industries are significantly more advanced than building construction.

Probably the key differences between building construction and other industries that affect technology development can be summarised as:

- other industries have higher profits that enable them to invest larger sums in technology development;
- other industries have few, very large, key organisations who can ‘drive’ a technology to suit their requirements.;
- other industries have less complex supply and communication chains than building construction.

Generally, the first two of these points are true. In process engineering, this has resulted in the formation of the EPISTLE and PIBASE consortia who have been able to push forward with information sharing standards within STEP [ISO 10303 parts 221 and 227]. It is also true of shipbuilding where major European and US initiatives have also developed into standards [ISO 10303 parts 215, 216, 217].

Another industry with similarities to building construction is offshore engineering. Available investment through the Petroleum Open Software Corporation (POSC) has enabled the development of the 'Epicentre' model that incorporates many aspects of exploration and production.

AEC/FM Industry Expectations

Building owners are looking for solutions that can provide buildings that are:

BETTER: Better quality without liability.

Building owners are demanding flexibility and quality in their buildings that stand up to the pressures of their business environments.

FASTER: Reduced delivery time for industries and the buildings that support them.

The life-cycle of design and delivery for most products today has decreased from a few years to a few months. The facility, its reconfiguration, and its creation are expected to keep pace.

CHEAPER: Recover the cost from a fractured process.

It has been estimated that up to 30% of the cost of a building project is due to the fractured processes and communication of the AEC/FM industry. Building owners demand facilities that are less expensive to construct, maintain, and operate.

GLOBAL: The AEC/FM process has become global in nature.

It is almost impossible to find a building being built today that does not contain products built or purchased internationally.

International Alliance For Interoperability (IAI)

What is the IAI

The IAI was started by twelve companies involved in the AEC/FM Industry. They were all interested in being able to work together 'interoperably'; that is, they wanted to be able to work with each other’s information without being concerned about the software they were using or which anyone else was using.

This group created a series of prototype software applications that were demonstrated at the A/E/C Systems ‘95 show in Atlanta, Georgia. These prototypes proved that interoperability was not just a dream; it could be made into reality.

With this successful public demonstration, the original twelve companies opened up participation in this effort in September 1995 to AEC/FM companies worldwide. The IAI was born!

There are now 9 Chapters worldwide, each serving the needs of a geographical region. Membership of the IAI has grown to over 600 companies from over 20 countries

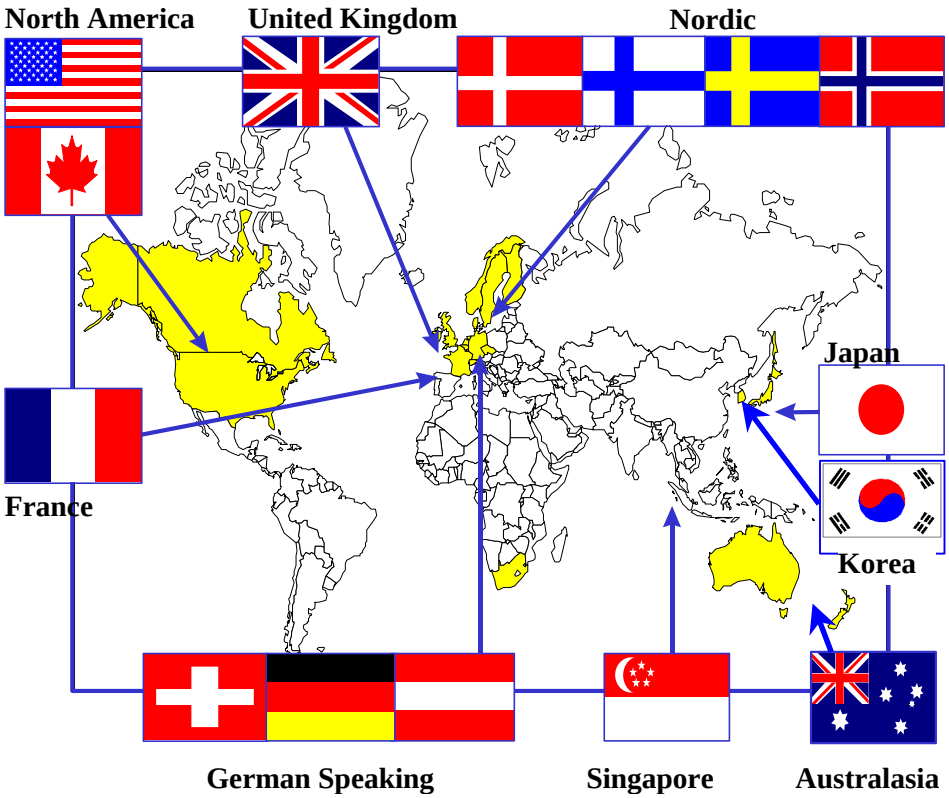

Figure 3: IAI Chapters Worldwide

Austria
Finland France Germany Hungary Ireland
Japan Korea Netherlands New Zealand Norway
Singapore Switzerland South Africa Sweden UK
USA

IAI Mission, Vision and Values

The IAI Vision, Mission and Values are contained in a Charter that has been agreed by all of its international participants:

VISION

To enable software interoperability in the AEC/FM industry.

MISSION

To define, promote and publish a specification for sharing data throughout the project life-cycle, globally, across disciplines and across technical applications.

VALUES

- Not-for-profit industry organization
- Membership open to any company working in the AEC/FM industry
- Action oriented: Alliance vs. Association
- Consensus based decision making

- Incremental delivery rather than prolonged study
- Global solution
- AEC/FM industry professionals working with software professionals to define standard specification
- Specification to be open for implementation and use by all software vendors
- Design for specification to be extensible
- Specification will evolve over time

How is the IAI Organized

The IAI is organized into Chapters, each of which represents an international region.

Chapters

Each Chapter is a separate organization and is established according to local custom. For instance, in North America and the United Kingdom, the Chapters are incorporated as not for profit companies. The German Speaking Chapter however is established as a form of Technical Association.

Each Chapter contributes to the overall IFC specification process, and wherever possible, participating members are involved in the process of completing technical components of the IFC specifications.

Membership

The IAI has an open membership policy. It has participation from many different types of organization in the AEC/FM industry, including architects, engineers, contractors, building owners and managers, building product manufacturers, software vendors, information providers, government agencies, research labs, and universities.

The IAI member companies and the individuals representing these companies have skills that fall into two general categories:

> ***Domain experts*** are individuals involved with the daily practice of their expertise in the building industry, such as architects, engineers, contractors and facility managers. Domain experts are typical of the end users that can enjoy the significant benefits of the IAI and applications based on the IFC Specifications.
>
> ***Technical experts*** are individuals with a background in research, software design and engineering and typically have some experience in the AEC/FM industry.

Together, these two groups of experts leverage their respective skills towards the common goal of defining the shared project model.

Funding

IAI is a not for profit organization that funds its operation through membership fees. These funds are used for several purposes:

- hosting the Chapter domain meetings
- paying for business management and technical coordination activities
- contributing towards the cost of specialized consultants as needed to further the development of IFC specifications

Each Chapter sets its own level of membership fees according to its own requirements. Contributions to the funding of the international organization are paid by each Chapter.

Domain Committees

In an effort to categorize the various domains involved in the building life-cycle, each Chapter has established a series of “domain committees” that are best suited to their representative members. Each domain committee is interested in a specialized discipline, such as architecture or HVAC, or a specialized process,

such as construction or facilities management. A domain committee is composed of members with experience in the area of the domain's specialization.

A domain committee is chaired by a domain expert who is assisted by a specialist in the development of computer software specifications (or models). Each committee develops a specification or model of their particular domain as it applies to the overall shared project model. The domain committees typically include other domain experts and technical experts. Product manufacturers and software vendors are also members of the domain committees, which facilitates coordination between the discipline and their product suppliers and technology vendors. Cross-domain meetings and coordination are promoted to integrate the needs between domains.

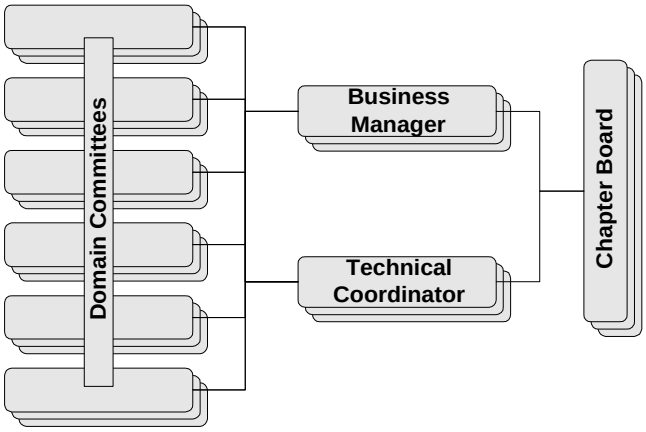

Figure 4: Current IAI Chapters Organization

International Organization

Each Chapter is represented on the International Council of the IAI. The International Council meets twice a year to coordinate the business and technical work being carried out.

The international organization includes business and technical committees which coordinate planning and implementation strategies. These include:

- International Council (IC)

  The executive board of the IAI comprising two designated members from each Chapter.

- International Executive Committee (EXCOM)

  Co-ordinates all international business activity and manages the international operations and finances of the IAI on a day to day basis between meetings of the International Council. Members of EXCOM are the International Business Manager, the International Technical Director and others appointed by the International Council as considered necessary.

- International Technical Management (ITM)

  Coordinates all international technical activity, overviews project proposals to ensure that they meet the development goals of the IAI and reviews the available resources required to complete projects. All Chapter Technical Coordinators are members of the ITM together with all leaders if international committees, international project leaders and the International Technical Director.

- Specification Task Force (STF)

  A specialist group of technical experts who ensure that all IFC projects are integrated into the IFC Object Model and who produce the documentation describing the Model.

- Software Implementation (SIC)

  Represents the interests and views of software companies producing IFC implementations.

- Research/Advisory (RAC)

  Comprises respected persons who provide guidance on future IFC development strategy

From time to time, the ITM may establish a short term Task Force to carry out a particular function or provide advice on a particular topic of interest. An example is the 'Certification Task Force' established to advise on testing and certification strategies for IFC compliant software.

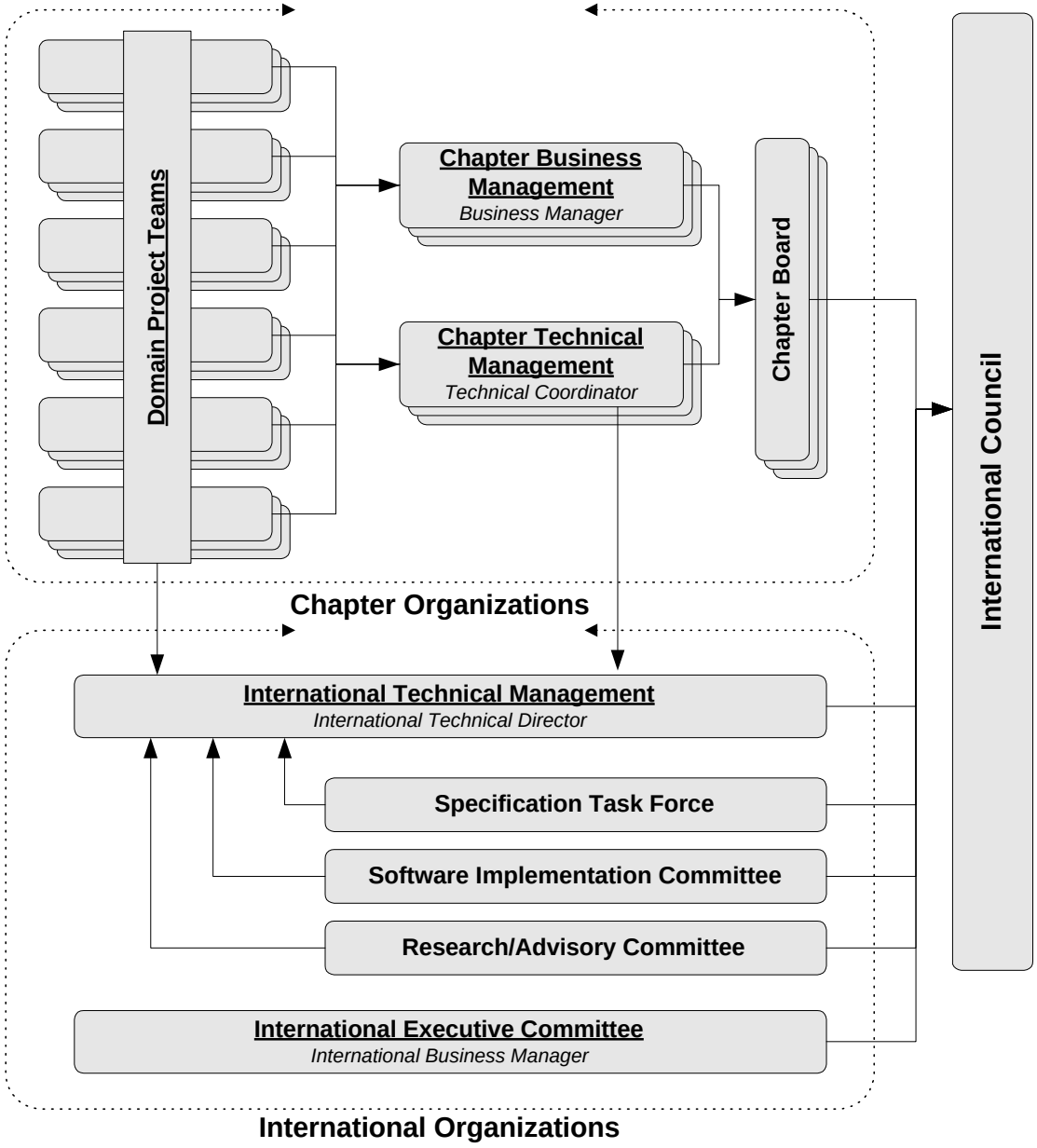

Figure 5: IAI International Organization

What is a Model

The key deliverable of the IAI is the IFC Object Model. The term ‘model’ in this case means that it provides a formal specification of requirements that can then be used by software authors to create the IFC compliant software applications.

According to the Oxford English Dictionary, a model may be defined simply as ‘a representation of structure’. In the world of objects, the model is used to represent the structure of information and how that information relates to other information.

The Role of the Model

A model is used to assist in understanding and communicating requirements. There are many different types of model that can be created, each fulfilling a specific purpose in the analysis, design and implementation of a system. However, those most frequently used and of interest to users in the AEC/FM industry are process models and object models.

Process Models

A process model describes the tasks that are undertaken within a defined business activity and shows how and what information needs to be communicated between tasks. That is, it describes the messages that one task sends to another and that are the ultimate result of the process.

The value of the process model is that it can be used to expose the manner in which the defined business activity is conducted (the ‘As-Is’ model) and the manner in which is going to be conducted (the ‘To-Be’ model). For this reason, process models are fundamental tools in business process improvement and business process reengineering.

Because the process model also exposes the information that exists (or should exist) within a process, it is also a preliminary requirement during the analysis phase of system development. It provides the information and that needs to be captured by the object model.

Process models may be described using various graphical notations. That preferred is the IDEF0 notation conforming to Federal Information Processing Standard (FIPS) 183. An appendix describing the use of IDEF0 is included within the ‘Guidelines for the Specification of IFCs’.

Object Models

For IFC development, an object model is a representation of the information content and structure that needs to be exchanged or shared. It is also used during the analysis and design phases of IFC development as a means by which industry specialists can review and comment on the work carried out by information modeling specialists.

Each project defines an object model that specifies the structure of data in support of the business processes identified. The Specification Task Force then integrates this model into the IFC Object Model.

The IFC Object Model exists in various views or representations:

- ***Primary View***

  This is the tabular form of the model as it appears in the IFC Model Reference. Spreadsheets that may be used by projects provide direct input into the IFC Object Model through a database repository that is maintained by the Specification Task Force***.***

- ***Graphical View***

  This is a view of the model using a graphical notation known as EXPRESS-G. It is an informative view of the model provided to ease model review.

- ***Specification View***

  This is a view of the model using the international standard EXPRESS data definition language. It is the view of the model that defines the structure of files and databases used for information exchange and sharing.

- ***Interface View***

  This is a view of the model using the Interface Definition Language as defined by the international 'Object Management Group'. At present, the Interface view of the model is limited but it is intended that it will become a valid view in the future for the specification of information exchange and sharing using advanced client/server computing technology.

Industry Awareness of Models

The diagram below indicates a normal curve for take up and usage of new technologies together with a proven curve of the benefits that accrue from implementing the use of successful information technologies at the various stages in the usage curve. This dual curve applies to the implementation of object technology, which is undoubtedly a major information technology success. It is expected that innovative developers and users of IFCs will gain benefits over their competitors who wait.

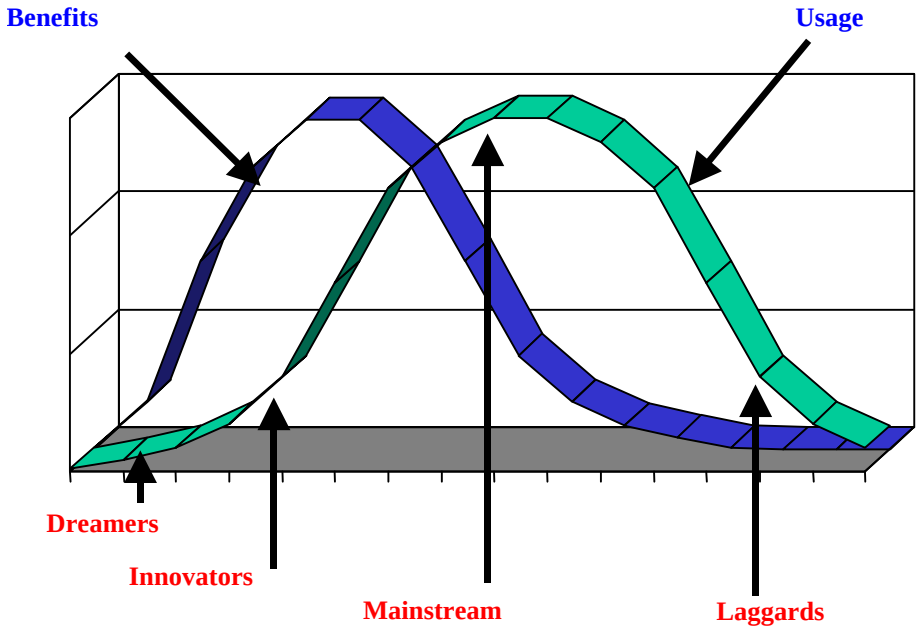

Figure 6: Innovation and Benefit

Industry Foundation Classes

What is an IFC

The intention of the IAI is to specify how the 'things' that could occur in a building (such as doors, walls, fans, etc.) should be represented electronically. These specifications represent a data structure supporting an electronic project model useful in sharing data across applications.

Each specification is called a 'class'. We use the word 'class' to describe a range of things which have common characteristics. For instance, every door has the characteristics of opening to allow entry to a space, every window has the characteristic of transparency so that it can be seen through. Door and window are names of classes.

The classes defined by the IAI are termed 'Industry Foundation Classes' or IFCs. The reasons for this are:

- IFCs are defined by the AEC/FM industry
- They provide a foundation for the shared project model
- They specify classes of things in an agreed manner that enables the development of a common language for construction

An IFC specifying a fan is more than a simple collection of lines and geometric primitives recognized as a fan. It knows that it is a fan and knows about the characteristics that make it a fan.

There may be many fans used on a project. Each fan used conforms to the class specification but may have different values assigned to its characteristics. One fan may have an inlet connection radius of 900mm whilst another may have an inlet connection radius of 1200mm. Both are fans and have the characteristics of a fan defined in the IFC specification. When a class is used may times, each instance of its use is called an object.

IFC-based objects allow AEC/FM professionals to share a project model, yet allow each profession to define its own view of the objects contained in that model. Other professionals can later use a fan object designed by an engineer. This leads to improved efficiency in cost estimating, building services design, construction, and facility management.

IFCs enable interoperability among AEC/FM software applications. Software developers can use IFCs to create applications that use universal AEC/FM objects based on the IFC specification. A centrifugal fan object created in one application can communicate with another IFC compliant application. This second application recognizes the centrifugal fan object, which reveals:

> *“I am a fan and I know that I am a centrifugal fan. I also know how much air I must deliver against what resistance offered by the ducted system I am connected to, the radius of my inlet connection and the length and width of my outlet connection. Additionally, I know what my operation is, what my geometry is, and so forth.”*

The second application is able to understand these characteristics and add information to the object because it also uses the IFC specifications defined by the IAI. Applications that support IFCs will allow members of a project team to share project data in an electronic format. This will ensure that the data is consistent and coordinated. Furthermore, this shared data can continue to evolve after design, through construction, and occupation of the building. Information generated by the project design team will be available in intelligent, electronic format to the building construction team through their IFC compliant software and to building facilities managers through their IFC compliant software.

Member companies in the IAI, frustrated with the current fractured information systems of the AEC/FM industry, are working together to make this happen. The IAI includes industry leaders from all aspects of the international AEC/FM community. This group is uniquely qualified to develop the specifications for the IFC. However, the IAI is not, and will never be, a software company. It works with software companies that serve the AEC/FM industry to promote the IFC specifications and to enable them to create a new generation of software applications that apply the potential of the computer in the AEC/FM industry.

The entire AEC/FM industry and all of its customers benefit from the work of the IAI!

How Are IFCs Implemented

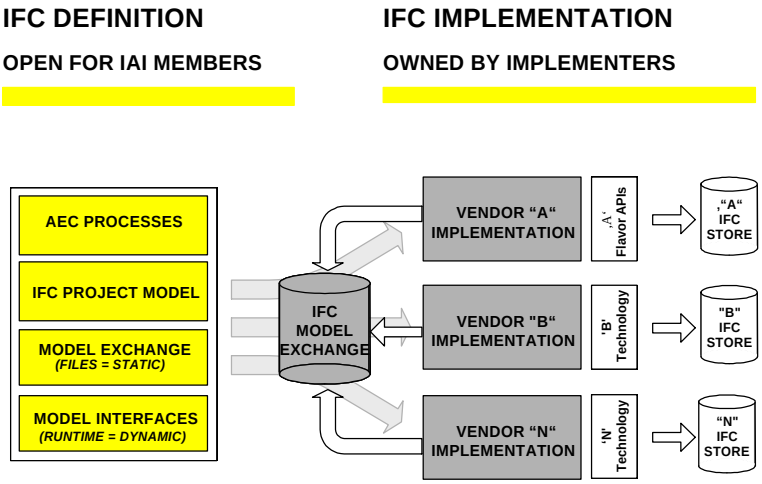

Figure 7: Vendor Implementation of IFCs

The IAI does not write software.

The IAI develops the IFC Object Model and supporting specifications. This common project model serves as the foundation upon which the software authors can develop applications that read and write to the physical file format used to communicate with IFCs.

Application software is developed independently by software authors.

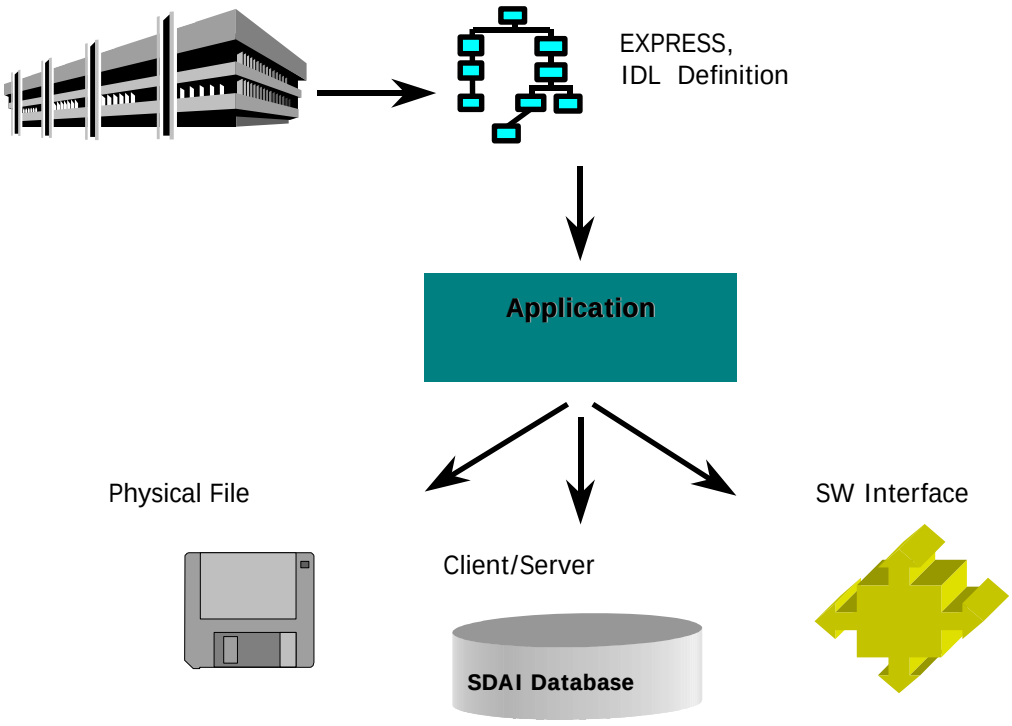

Figure 8: Implementation Scenarios

There are three possible ways to share data using IFCs.

1. By creating a physical file of information that may be shared across a network, by email or on a physical medium such a floppy disk. The structure of the file is determined by the EXPRESS language Specification View of the IFC Object Model and the syntax of the file is determined by ISO 10303 part 21.

   Presently, most software applications share information using physical files.

2. By placing information in a database which has an interface defined according to the ISO 10303 part 22 (Standard Data Access Interface) for putting in and getting out data. The structure of the information sent to or received from the database is determined by the EXPRESS language Specification View of the IFC Object Model.

   Presently, a number of software applications can work using shared databases (also known as project model servers).

3. By using software interfaces that can expose the information content of defined groups of attributes within an object. Software interfaces allow for direct communication between applications without the need for an intermediate file or database.

   The use of software interfaces is experimental at present. There are no implementations that brely on the use of software interfaces.

Together the IAI and the AEC software community are defining this model, but it remains the task of the software vendors to implement the IFC specification and to bring applications to market.

The IFC Release Cycle

The objective of the IAI is to issue a major release of the IFC Object Model annually. In addition, interim releases of the model may be issued to satisfy a particularly urgent application need or to make corrections to the model as a result of implementer/user feedback.

IFC releases are numbered according to the extent of updating that has occurred. Release numbering is:

- ***Integer*** (e.g. 2,3 etc.) A major release at which the range of supported industry processes is extended and at which ALL IFC model documentation, including informative and guideline publications, is updated and reissued. Updated documentation is provided to all members.
- ***Dot*** (e.g. 2.5, 3.1 etc.) A major release at which enhancements to the IFC Object Model Core and/or Resources are issued. The range of supported industry processes is not normally extended. Documentation concerning the formal specification of the model is updated and reissued. Updated documentation is provided to all members.
- ***Dot-Dot*** (e.g. 2.5.1, 3.1.2) An interim release including model corrections. Addendum notices are issued to software implementers and are available to all members via the IAI international FTP site. Documentation is not reissued.

How are IFCs Developed

To develop the IFC specification it is essential to have a common view of AEC/FM data that can be shared by AEC/FM and software development professionals. This common view is known as the IFC Object Model, defined using a top-down approach. By starting with a very general view of the AEC/FM industry, an overall model of a building can be defined and successively worked into a detailed model suitable for creating software applications. The described processes and the accompanying figures which follow are representative of the information found in the Guidelines for the Development of Industry Foundation Classes.

- ***Usage Scenarios*** are written descriptions of the processes that users perform, such as how a facilities manager maintains the various assets within a building (such as an air handling unit). These usage scenarios capture the decisions and information that are used during each step of the process.

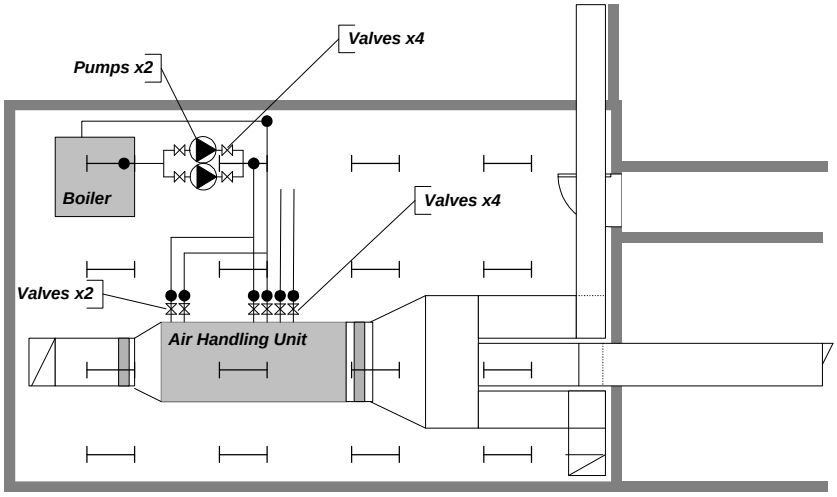

Figure 9: Usage Scenario Diagram

- ***Process Diagrams*** give a visual representation of the process that is being defined. A process diagram is a diagrammatic representation of a usage scenario. For instance, the process of scheduling maintenance can be visually identified.

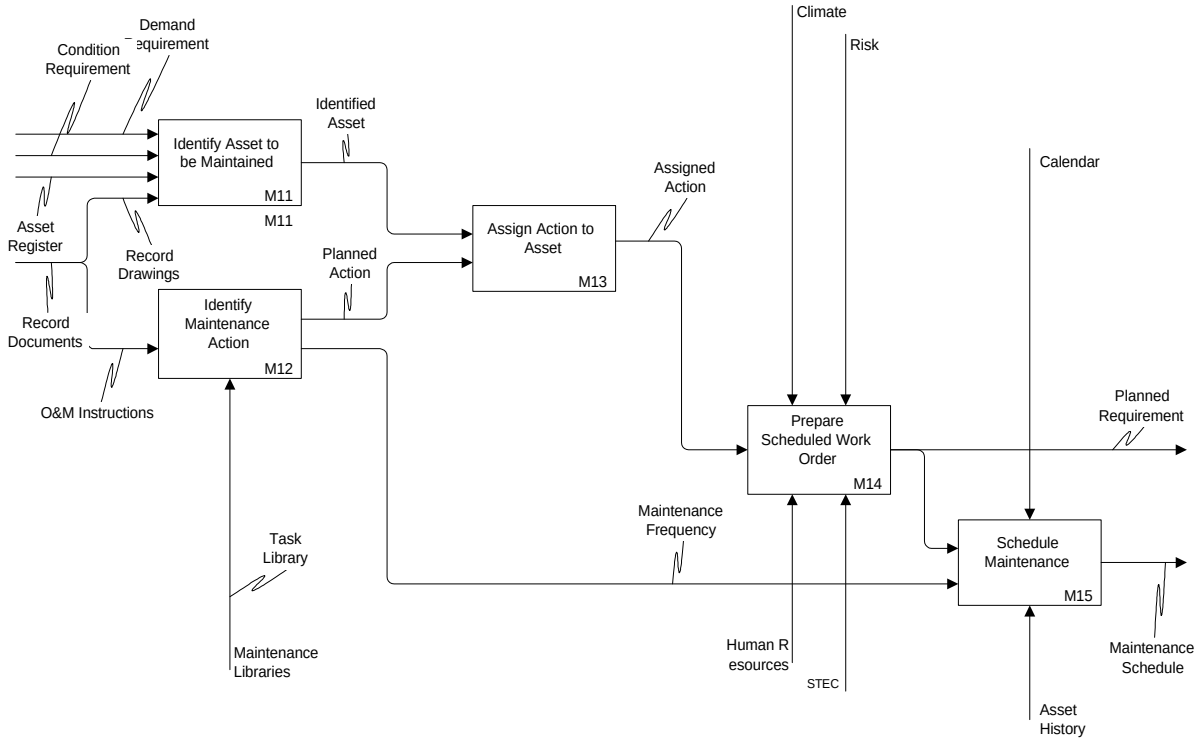

Figure 10: Process Model in IDEF0 Notation

- ***Classes*** are object-oriented programming components used to define objects. Classes are designed to support the needs of the process and include concise definitions of the AEC/FM data objects. Classes can clearly represent physical objects such as a centrifugal fan or more abstract objects such as the cost of the fan and the process by which it is installed.

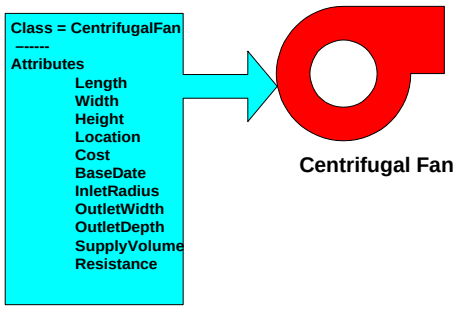

Figure 11:A Defined Idea or Class

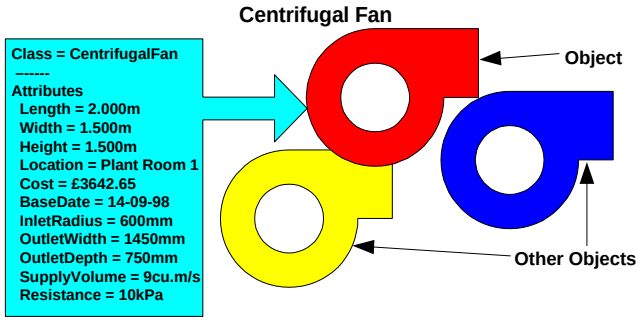

Figure 12: Instances of a Class or Objects

- ***Attributes*** are information about the class or its interface and are added to fully define an AEC/FM object. For example, a centrifugal fan has a supply air volume and a resistance against which it can supply this volume of air, etc. These attributes are stored within the appropriate centrifugal fan class***.***

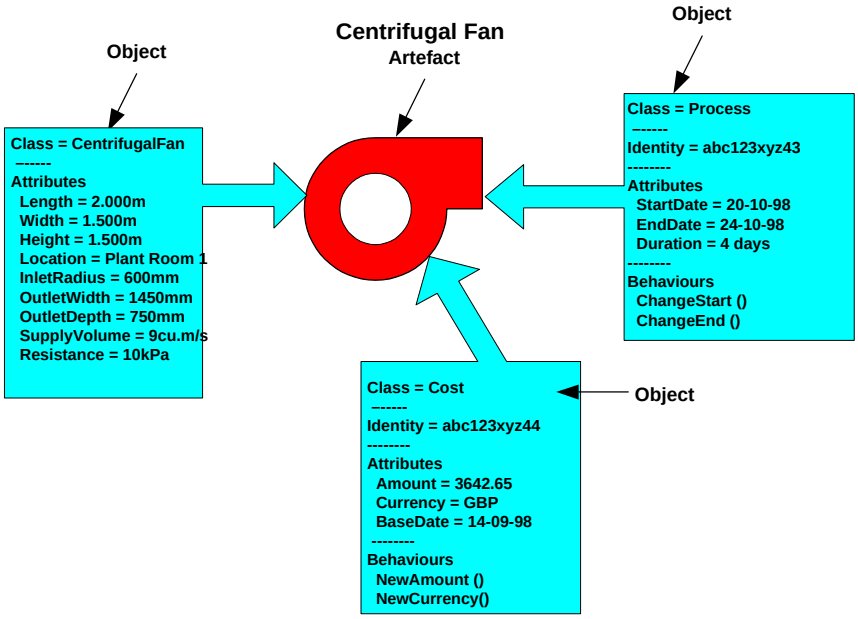

Figure 13: Breaking Down Classes with Abstract Ideas

- ***Relationships*** occur between classes. For example, a fan has a relationship to a starter. A starter in fact starts a fan, and reciprocally a fan is started by a starter. Relationships are important in defining object behavior in ways that mimic the behavior of the real world artefacts.

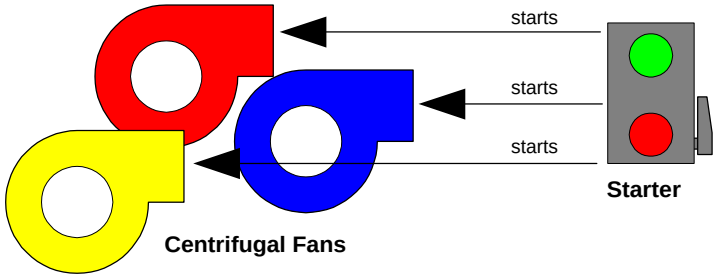

Figure 14: Relationships Between Objects

- ***Interfaces*** are used to provide access to the object. IFC interfaces are designed to support the AEC/FM processes, and enable software vendors to implement IFC based objects. For example, a fan object must support a variety of AEC/FM disciplines and include interfaces for costing, structural consideration, acoustic performance, among others.

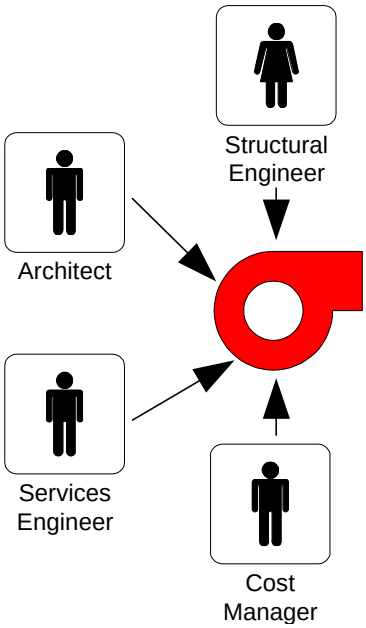

Figure 15: Views of an Object

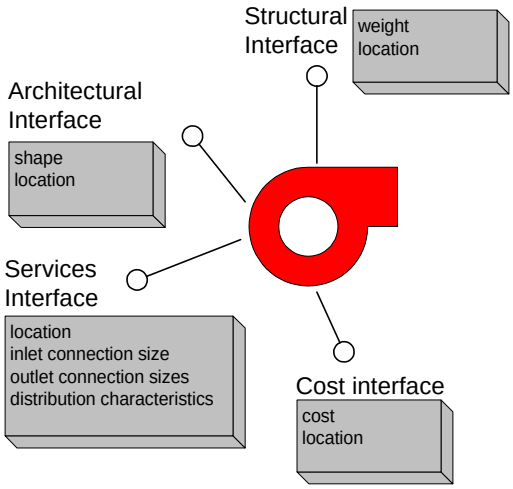

Figure 16: Interfaces on an Object

- ***The object model*** is used to represent the classes, their interfaces, attributes and relationships in a composite representation. The IAI uses Express-G for its model notation, which allows a graphical representation of the object model to be created.

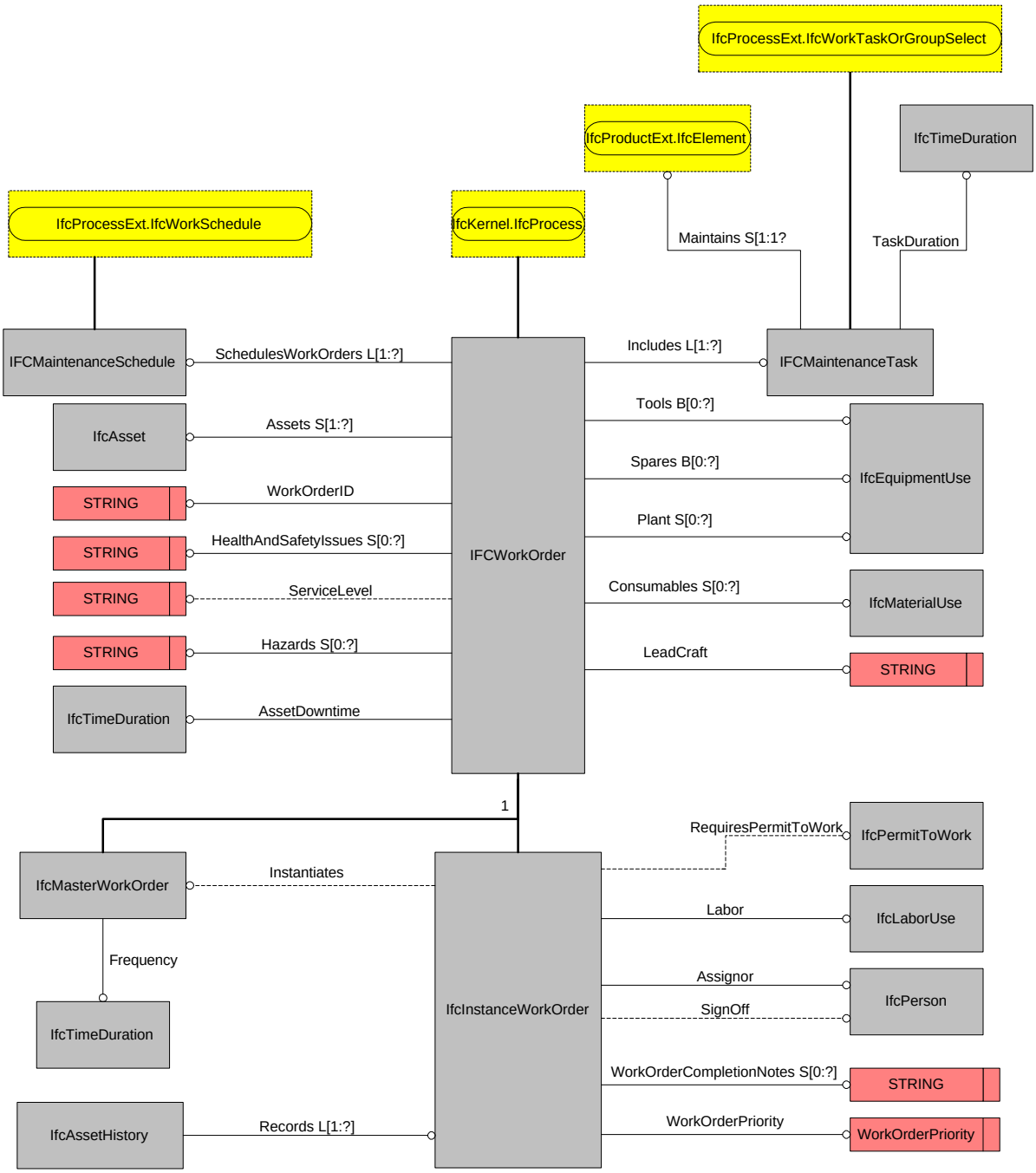

Figure 17:Object Model in EXPRESS-G Notation

- ***Test cases*** are created to exercise the model using data from a predefined building and a specific usage matched to an industry practice. These test cases are based on the usage scenarios developed along with the IFC information model and allow a software developer to test their application's ability to conform to the IFC Specification. The test cases provide live data for use with objects, interfaces, attributes and relationships. Figure 18 contains sample test case data.

Entity/Attribute Description		Incoming Value	Units
Space1			
	Area	26.6261	square meters
	RoomNumber	Room 1	String
Wall1			
	Material	Brick	String
	Orientation	180	degrees
	WallArea	12.36	square meters
Window1			
	Material	3 mm clear float	String

Figure 18: Sample Test Case

IFC Release Deliverables

IFCs are documented for two readers: the AEC/FM professional and the technical specialist (a category that includes both specialist object modelers and software developers). Documents in this first release include:

An Introduction to the IAI and its IFCs

Level: Introduction
Availability: Public

This document, the *Introduction to the IAI and its IFCs*, provides AEC/FM industry professionals with an introduction to the IFC Specifications including the IFC based shared project model concept. It outlines the benefits of IFC compliant applications to end users, provides an overview of IFC, the IAI, and summarizes the processes that have been modeled in this release of the IFC Specifications.

IFC Model Guide

Level: Technical
Availability: Public

The *IFC Model Guide* provides a reference for the technical requirements, content and arrangement of the IFC Object Model. It includes the following major elements

- The *IFC Model Architecture* which describes the principles of how the IFC Object Model is organized
- The *IFC Object Naming and Development Convention* which describes how all of the elements of the model should be named and the guidance rules for the creation of classes and property sets.
- Samples of parts of the IFC Object Model for information.

The Guide is intended for specialist object modelers who are interested in IFC development and for software developers who need to understand how the IFC Object Model has been created.

Guidelines for the Specification of IFCs

Level:	AEC/FM Professional
Availability:	Public

The *Guidelines for the Specification of Industry Foundation Classes* provides an extended reference on how to develop IFC specifications in a consistent way. It describes how to develop a project proposal, documentation of processes and classes and development of domain object models that can then be synthesized into the overall IFC Object Model. It includes appendices that describe in simple terms some of the technologies used in IFC development. These appendices are useful in learning and understanding why and how IFCs are specified in a manner that is independent of software implementation.

AEC Processes Supported by IFC

Level:	AEC/FM Professional
Availability:	Public

The *AEC Processes Supported by IFC* documents the AEC/FM domain processes that the IFC Object Model supports in this release. Therefore, this document effectively defines the scope of AEC project information included in the current IFC Release

IFC Model Reference

Level:	Technical
Availability:	IAI Members Only

The *IFC Model Reference* defines the IFC Object Model. This includes all of the information required by the AEC processes structured in an IFC model detailing object classes, standard interfaces and data types. It also presents several key concepts used in the design of the IFC model including: model structure, capturing design intent, sharing semantic relationships, model extension by application developers, and model exchange versus runtime interface views of the IFC Object Model.

It also documents the Information Model Exchange file used to represent the IFC Object Model. This Information Model is defined using the international EXPRESS standard and can be used directly by software developers. This document provides an overview of the physical file format.

Also documented is the runtime interfaces view of the IFC Object Model which complements the Exchange Model view. This view is presented using Object Management Group's Interface Definition Language (IDL), which may also be used directly in software CASE tools to automate parts of the software development process.

This is the principal document in the IFC Release Document Suite and contains a large quantity of information. It is of value both to end users and to software implementers. To assist navigation, it is made available primarily in HTML format and can be browsed using Web browsers such as Netscape and Microsoft Internet Explorer.

IFC Software Implementation Guide

Level:	Technical
Availability:	IAI Members Only

The *IFC Software Implementation Guide* provides information and guidance to software programmers on how best to go about developing IFC compliant software. It draws on the experience of those organizations who have already developed such software and contains vital information which can reduce the time (and cost) of development. It discusses potential implementation strategies and includes list of software toolkits and platforms which are available to speed up the development of IFC compliance.

IFC Implementation Certification Guide

Level:	Technical
Availability:	IAI Members Only

The *IFC Implementation Certification Guide* describes the process which has been adopted for certification of IFC compliant software applications and how such compliance must be demonstrated. It also describes the use of the compliance testing toolkit software and how this should be obtained.

IFC Release History and Planning

IFC Release 1.0

Release 1.0 of the IFC Specifications began the incremental definition of a shared project model used throughout an AEC/FM project life cycle. This initial release included models supporting some processes in architectural design, HVAC engineering design, facilities management, and cost estimating. The resulting integrated model represented only a fraction of the scope that will define a complete shared project model. However these were identified as critical to the first incremental release of the IFC Specifications. The IFC Release 1.0 Specifications limited its scope to a set of achievable milestones:

- A “core” model plus plug-in extensions software architecture was established to ensure structured extension of the IFC model with minimal disruption to between releases.
- Four AEC/FM domains were addressed: architecture, HVAC engineering, construction management, facilities management and only a small set of the processes used in these domains were supported.

IFC Release 1.5

Release 1.5 of the IFC Specifications did not extend the domain coverage beyond that which was developed for Release 1.0. However, building on the implementation experience of Release 1.0, the IFC Technical Architecture was improved and the Core of the IFC Object Model extended and stabilized to provide a platform for commercial software development.

IFC Release 1.5.1

Resulting from trials of the Release 1.5 model, an update was issued to resolve implementation problems. The opportunity was also taken to improve core and resource elements of the model.

IFC Release 2.0

Release 2.0 extends the domain coverage of the IFC Object Model and includes domain processes identified below. Key parts of the Core and Resource models remain unchanged although some additional features are added to support new domain processes.

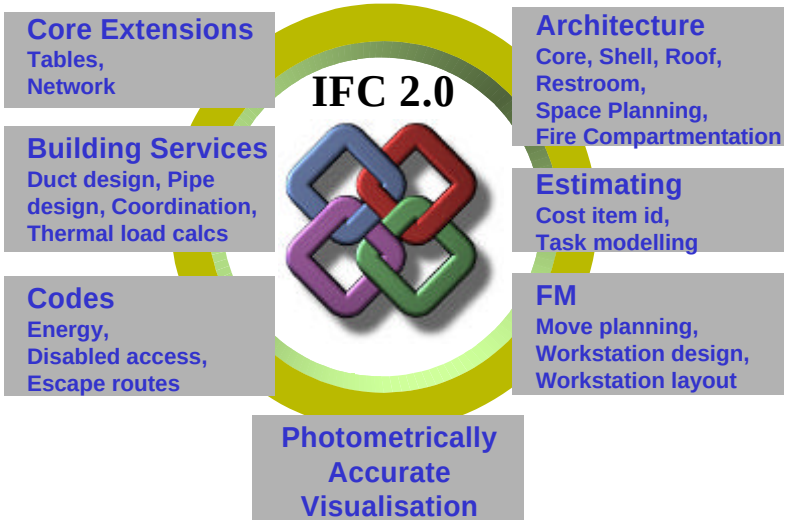

Figure 19: New Processes in Release 2.0

IFC Release 3.0

It is intended that Release 3.0 will significantly extend the domain coverage of the IFC Object Model. Proposals are identified in Figure 11.These may be subject to change depending on resources available to carry out this volume of work.

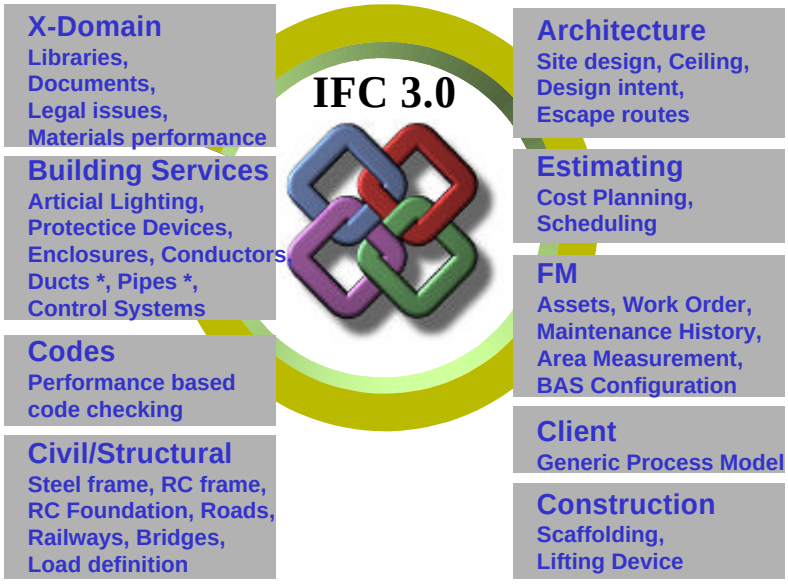

Figure 20: New Processes in Release 3.0

More Information About the IAI

International Web Site

For a global overview of activities, IAI maintains an international web site at the following address:

http://www.interoperability.com

Chapter Web Sites

Most Chapters of the IAI maintain web sites of their own that give information relevant to the operation of that Chapter and in a language (or languages) that can be most easily understood by their membership. Chapter web site addresses can be obtained from the Technical Co-ordinator or Business Manger of the Chapter concerned. Access can also be obtained to local sites via the international web site.

International FTP Site

IAI members have access to an international FTP site that contains complete information about the latest release of the IFCs. Additionally, Chapters, projects and domain committees are encouraged to place documents under development onto the FTP site.

Files in any format can be placed onto the FTP site and some of these files can be very large. When placing files that cannot be viewed on-line or that are very large, members are encouraged to accompany the file with a small summary file written in standard text (ASCII) format that can be viewed or quickly downloaded so that other members can easily determine if they need it. Placing a summary file is a courtesy to other members since downloading a file of several megabytes capacity and then finding that it is not the current version or is not needed can be both time consuming and frustrating.

ASCII files can be written using any text editor such as the Windows Notepad.

Access to the FTP site is protected by password. The password is supplied to members on joining by the Technical Coordinator or Business Manager of their Chapter. In order to prevent unauthorized access, the password is changed at approximately six-month intervals.

Committee Email Lists

The IAI and its various committees (international, project and domain) normally communicate via email. It is unusual for members to use paper-based communication. To support widespread communication, many committees make use of email list servers (also known as ‘exploders’) which allow an email to be sent to a single address and then automatically distributed to all other email addresses on the list.

The exception to this rule is the distribution of passwords to the international FTP site which is NEVER distributed electronically.

Official Language

The official language of the IAI is English. The default spelling is the American form, namely organization rather than organisation, color instead of colour. The authority for spelling is the Spelling Checker distributed with Microsoft Word 97 with language set for English (United States). Documents for international distribution should be in the official language.

The IAI and STEP

The IAI is committed to cooperation with other technical organizations active in the industry. To that end, a Memorandum of Understanding between ISO TC184/SC4 (more commonly known as STEP) and the IAI was presented at the October 1997 meeting of ISO TC184/SC4 in Florence and the October 1997 meeting of the IAI International Council in Singapore

Memorandum of Understanding between ISO TC184/SC4 and IAI

This Memorandum of Understanding establishes collaborative working practices between the International Standards Organization Technical Committee 184 Sub Committee 4 (SC4) and the International Alliance for Interoperability (the IAI).

Both SC4 and the IAI support developing neutral definitions of information that can be electronically shared. The interests of SC4 concern all industry sectors including building construction whilst the interests of the IAI are focussed on building construction.

The objectives of this Memorandum of Understanding are:

- to strengthen development efforts for building construction within SC4 through technical input and participation by IAI member companies;
- to strengthen the development of Industry Foundation Classes (IFCs) within the IAI through technical input and use of technologies and appropriate standards (completed and developing) within the scope of SC4.

In support of these objectives:

SC4 will:

- invite the nominated liaison officer between the IAI and SC4 to participate in SC4 meetings to report on relevant IAI activities;
- hold joint sessions with members of the IAI during its international meetings;
- invite representatives of the IAI to participate in SC4 Working Group meetings;
- share information about developing standards, technical reports, standing documents and other material as appropriate to the interests of the IAI;
- respect the copyright of IAI and confidentiality of selected IAI materials as requested.

IAI will:

- invite the nominated liaison officer between SC4 and the IAI to participate in international meetings of the International Technical Management Committee to report on relevant SC4 activities;
- collaborate with related industry groups within SC4;
- identify requirements for information sharing within building construction to SC4;
- share information about developing IFC specifications, guides and other material as appropriate to the interests of SC4;
- provide information on developing and testing of IFCs to the benefit of SC4;
- provide technical input to developing standards within SC4;
- respect the copyright of ISO and confidentiality of selected ISO material as requested.

Both SC4 and the IAI see the potential for a natural progression of industry validated specifications towards formal standards. The IAI recognizes that SC4 is the appropriate ISO committee for which the work of the IAI is most relevant as input to developing formal industry standards.

Both SC4 and IAI will encourage their participants to present the work being undertaken by its counterpart in a positive manner and will encourage further participation by industry within each other's activities.

Mutually agreed Collaboration Guidelines that set out the procedures for achieving the objectives stated above form part of this Memorandum of Understanding

